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GENERAL ARTICLES

EXTRAPLEURAL PNEUMONOLYSIS WITH LUCITE PLOMBAGE

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Introduction

Thoracoplasty has been and is today the outstanding surgical collapse measure in the therapy of pulmonary tuberculosis. It is essentially a deforming procedure. Phthisiologists, therefore, are constantly on the look-out for a procedure which will accomplish an adequate collapse and yet obviate the difficulty involved in thoracoplasty. Extrapleural pneumonolysis has been used from time to time to accomplish collapse of the lung, but never gained widespread popularity, largely because it encountered difficulties of its own. The advent of antibiotics and the appearance of inert plastics in surgery have made possible a re-examination of some of the procedures previously abandoned. We should like to present our experience with extrapleural pneumonolysis where lucite spheres were used as plombage.

Since Tuffier first performed the operation in 1893, extrapleural pneumonolysis has undergone numerous vicissitudes. The chief difficulty encountered has been to maintain the space mechanically created by the pneumonolysis. Various substances—gauze, rubber dam, balloons, fat, muscle, and oil most often—have been used as permanent or temporary tamponade. Each of these has certain disadvantages and has been discarded, although paraffin and air are still used. There has been a recent revival of interest in some centres in the United States, and paraffin plombage is now used again more often than for some years. Although Brock (1938), Roberts (1938), and Sellors (1938) gave the procedure impetus, it never gained widespread popularity. Reid (1946) reported fifty-four cases performed in Wales between the years 1938 and 1944. He used air to fill the space and mentioned a series of cases in England under the care of Barrett and Maxwell. Occasional reports in the United States' literature indicate that, while extrapleural pneumothorax is still used, it occupies a minor place in therapy. The chief reason for the lack of popularity for extrapleural pneumonolysis has been failure to find an ideal substance with which to fill the space.

The search continues. Wilson and Baker (1946) have set forth the criteria for an ideal substance. The material to be used must be light in weight, non-irritating and insoluble in the tissues. It is important that it be non-carcinogenic and non-antigenic and not resistant to X-rays. It should be capable of being moulded into a small enough form so that it can be introduced through a small incision and yet fill a varying-sized space. One may add that the substance should not swell or shrink to any marked degree, nor become chemically altered by the tissues.

The metals used successfully in surgery, such as tantalum, vitallium and stainless steel, did not cause tissue reaction but were discarded because they are too heavy and are radiopaque. Various non-metals were considered. Celluloid was light, inexpensive, and tissue reaction was not profound, but in time became brittle and crumpled with loss of elasticity. Methyl methacrylate, an acrylic resin marketed under the names of " lucite," " crysallite," " plexiglass " and " vitarilic," was one of the newer plastic materials which appeared to fulfil all the requirements. First used in reconstructive surgery to repair cranial defects, animal experiments were undertaken by Wilson and Baker in November 1944. A thin capsule of hyaline connective tissue formed around the implanted lucite. In their report of June 1946 they recommended its use in the treatment of pulmonary tuberculosis. Some months later we undertook the procedure, using 1-in. lucite spheres (Fig. 1).

Clinical Material

Our first lucite plombage was done a year ago, and in all thirty cases have been operated upon. Our choice of case has been essentially the same as chosen for thoracoplasty, with some modification. Large, thin-walled, peripherally placed cavities were excluded for fear that they would be broken into or would be unable to sustain the weight of the spheres. It is preferred that the disease be limited to the apex of the lung, but cases with disease extending down to the third anterior rib have been accepted. The presence of bilateral disease, apically placed, has not been a deterrent for use of this procedure. None of the cases were done simply because they were too young or too old to undergo thoracoplasty. Two cases, too sick to be considered for thoracoplasty, had pneumonolysis successfully performed. Desperate risk cases unable to have extensive surgery may in time be added to the indications.

All of the cases had had intrapleural pneumothorax attempted. Some were incapable of being established, while others were obviously inadequate, and were not likely to be improved by intrapleural pneumonolysis. Still others had had pneumothorax successfully maintained, then abandoned, and finally reactivation of the disease was noted. A number of the patients had already refused thoracoplasty.

Six patients were converted from extrapleural pneumothorax to lucite plombage. Threatened loss of the space or the necessity for maintaining the extrapleural space with considerable positive pressure were the usual deciding factors. In one woman's case a geographic-economic factor decided us to fill the extrapleural space with lucite spheres. Air refills after her discharge from the hospital would have meant a lengthy trip to the nearest physician.

PLATE V.

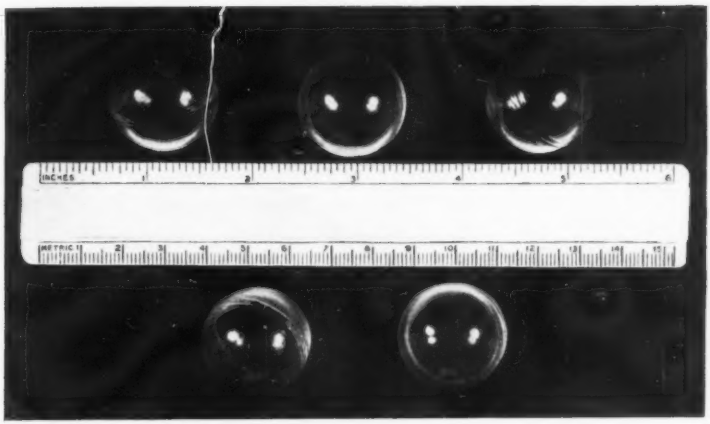

FIG. 1.

FIG. 2.

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Technique

All patients receive penicillin for two days before operation and for a week post-operatively. Pre-operative medication, given one hour before surgery, consists of morphine sulphate $\frac{1}{6}$ grain and scopolamine $\frac{1}{150}$ grain. Induction of anæsthesia is usually accomplished by intravenous sodium pentothal or cyclopropane. A mixture of ether and oxygen is subsequently used. Anæsthesia should be fairly deep, particularly as the dissection approaches the mediastinum.

At present the axillary approach recommended by Graham (1935) and Joannides and Schlack (1940) is used (Fig. 2). The incision is made over the anterior axillary fold, the arm being supported in a sling over the patient's head. The pectoralis major is retracted medially, and the minor is then lifted up and cut across. The second rib is denuded of periosteum, and a segment of about $2\frac{1}{2}$ in. is removed. Dissection is begun in the endothoracic plane, pressure being maintained against the chest wall rather than against the lung. Occasionally difficulty is encountered at the extreme apex and at the mediastinum, but slow, patient effort will usually allow the lung to yield. Adequate light is essential to see inside the chest. A strong headlight has proved to be the best for this purpose. The dissection is usually carried down to the undersurface of the second rib anteriorly and the sixth rib posteriorly, but will depend on the extent of the collapse desired. A hot moist gauze pack is inserted into the space to secure hæmostasis. A persistent ooze from any one point may require the insertion of some absorbable oxidised cellulose (Oxycel).*

The lucite spheres are sterilised by placing them in a 1 : 1,000 aqueous solution of benzyl-trialkonium chloride (Zepheran)† overnight. The spheres are then washed in sterile water or saline. The spheres are counted as they are dropped into the extrapleural space. Finger pressure may be necessary to cause the spheres to rearrange themselves properly. Between twenty and thirty-five are usually necessary, although the largest number used has been fifty-five and the smallest number sixteen. More recently we have felt that the smaller the number of spheres used to obtain adequate collapse the better. Good functioning lung is thereby saved from compression. Packing the spheres too tightly is avoided for fear that necrosis will result, either of the lung surface or the undersurface of the ribs. Before replacing the muscles and closing the incision, 10 c.c. of saline containing 200,000 units of penicillin are injected into the extrapleural space amidst the spheres. The wound is then closed in layers. Cotton and silk are used.

The post-operative course is one of the most satisfying features of the procedure. The patients seldom need oxygen, blood, or special nursing care. Replacement therapy is not strictly necessary, and plasma or blood has been used only in occasional cases. No untoward reactions and no profound shock in the immediate post-operative period have materialised.

Complications

Fluid.—All the cases developed fluid in the extrapleural space, some as early as twenty-four hours after operation, others in the second and third day.

* A Parke, Davis and Company product. † A Winthrop Chemical Company product.

In one or two cases fluid levels were visible two-thirds of the way up the space. Usually, however, less than half the space was filled with fluid. In more than half the cases the fluid strips and compresses the lung more than originally planned for. On fluoroscopy or roentgenogram one can see the spheres below the apex of the chest. This fluid gradually reabsorbs, and in nearly all the cases has disappeared as a definite level by the end of the third week.

Temperature.—Coincident with the appearance of fluid there is a temperature rise to from 100° to 101° F. In only one case was it higher. This mild pyrexia usually disappears within a week, often long before the fluid goes.

Subcutaneous emphysema.—This seldom occurs, and when it does it is never as troublesome or as extensive as in extrapleural pneumothorax cases.

Tearing the pleura.—The pleura was inadvertently torn in three cases during the dissection. In the first two cases the development of intrapleural pneumothorax was not recognised for twenty-four hours, until the patient was fluoroscoped. In one the insertion of a tube intrapleurally, connected to an underwater trap, resulted in re-expansion in forty-eight hours. The other re-expanded under observation without treatment. The most recent case had a tube inserted intrapleurally at the time of operation and carried to a water seal. A film eighteen hours later showed complete re-expansion.

In this connection one might mention a case not included in this series. An extrapleural pneumonolysis was started. As the operation progressed it was apparent that the pleura was very thin and free in the lower part of the chest, but thickly adherent in a symphisis about the size of half a crown near the apex. Pneumonolysis of the adherent portion was performed, and then mechanically the extrapleural and intrapleural spaces were combined by cutting the pleural layers. The patient has been receiving intrapleural air refills. It was felt that the thin pleura would not support lucite spheres.

Hæmorrhage.—In one case the presenting symptom was hæmorrhage and an occasionally positive sputum. Extrapleural pneumonolysis converted the sputum, but only temporarily controlled the hæmorrhage. Right upper lobectomy has since been performed. The extrapleural space with the lucite was left undisturbed.

Persistent Cavity.—In one case twenty-four spheres were inserted at operation. This was inadequate to compress a cavity visible in the first anterior interspace. A post-operative film taken after the fluid had been reabsorbed showed the cavity still patent. A second operation was undertaken a month after the first. A part of the third rib was removed and dissection carried upward from normal tissue toward the extrapleural space. The extrapleural space was covered by a fairly thick glistening surface, pink in colour, which looked very much like ordinary parietal pleura. There was about an ounce of free serous fluid in the most dependent portion of the extrapleural space. In some of the interstices between the spheres were blood clots in various stages of organisation. The space was enlarged by additional dissection, and thirty-nine spheres were inserted in all. The cavity is no longer visible on X-ray film.

Pain.—Most patients complain of some post-operative pain. This is transient and apparently less severe than the pain of the post-operative thoracoplasty

PLATE VI.

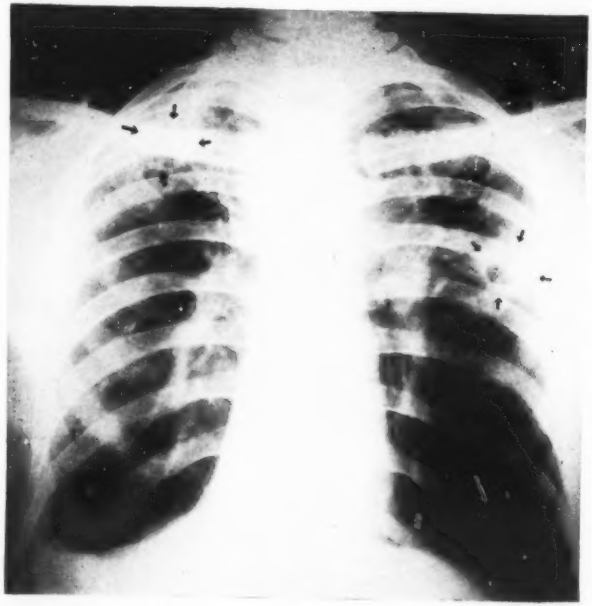

FIG. 3.

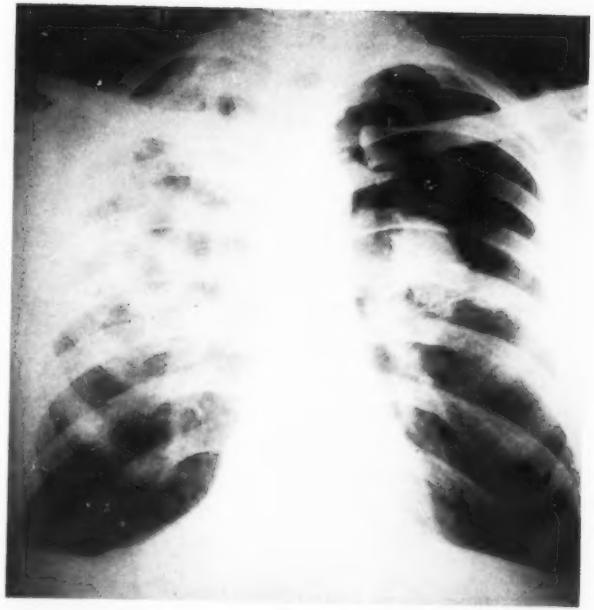

FIG. 4.

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PLATE VII.

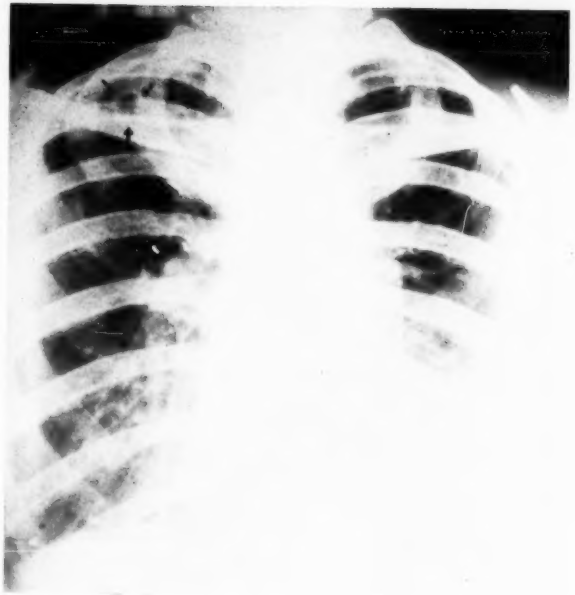

FIG. 5.

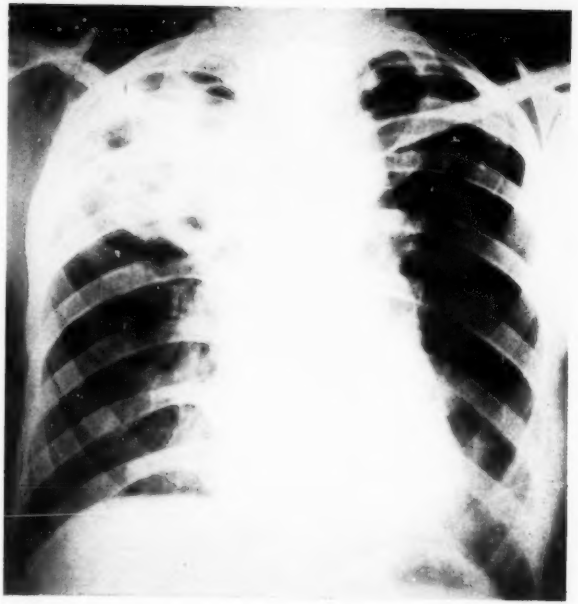

FIG. 6.

cases. However, a number of patients have developed troublesome pain two, three, and more months after operation. The site is usually the upper posterior chest and occasionally radiates to the shoulder or down the inner side of the arm, stopping at the elbow. In two cases the difficulty has resolved. In three others it persists, unalleviated by novocain injections, ethylene spray or mild sedation.

Representative Cases

Case No. 1—No. 9741, G. L. Thirty-five-year-old male; white, unmarried. Onset of disease in 1936 with a minimal lesion in the right upper lobe. Artificial intrapleural pneumothorax started at another hospital. After sputum conversion patient was discharged. Pneumothorax refills were maintained for five years and then abandoned. In 1946 patient experienced pain in the chest. Re-examination revealed a cavity in the right upper lobe, with spread to the left chest. Admitted to National Jewish Hospital. Left artificial intrapleural pneumothorax was started, followed by pneumonolysis of adhesions (Fig. 3). Extrapleural pneumonolysis on the right was performed 12.4.47 and maintained with air refills until 3.10.47, when lucite spheres were introduced. The patient converted his sputum and has remained negative since (Fig. 4). He complained of audible clicking of the spheres for a month following operation. Thereafter he was unaware of their presence. Some transient upper posterior chest pain was also experienced.

Case No. 23—No. 8044, G. G. K. Forty-one-year-old white married woman. Onset was in 1923, with laryngeal and pulmonary disease. Acute œdema of the glottis led to tracheotomy, which subsequently became permanent. Five admissions to the National Jewish Hospital are subsequently recorded successively for sacro-iliac, pulmonary, and kidney disease. Sputa and gastric residua were occasionally positive. Tracheal tube washings were also frequently positive. Right nephrectomy was performed. Bilateral pneumothorax had previously been attempted and failed. During last admission patient complained of cough and occasional streaking of blood in her sputum. Tracheal tube washings were positive. A cavity was visible in the right upper lobe (Fig. 5). Extrapleural pneumonolysis with lucite plombage was performed. Tracheal washings since operation are negative for tubercle bacilli. The cavity is no longer visible (Fig. 6).

Discussion

The cases presented in this communication are inadequate in number and have not been followed for a sufficient period for any analysis of end results of the procedure. The indications for pneumonolysis with lucite plombage are largely those for thoracoplasty. Thoracoplasty has been used in a very large number of cases over a long period of time and has proved itself to be so far the most satisfactory form of surgical treatment in pulmonary tuberculosis. Pneumonolysis with lucite plombage must, therefore, prove itself superior to thoracoplasty in order to displace it.

The advantages that may be listed for lucite plombage over thoracoplasty are:

Lack of deformity: Plombage is free from the disfiguring scoliosis and altered contour of the thorax which is incident to thoracoplasty. This is particularly important to women in whom marked psychic disturbances are

common from this source. With the antero-lateral approach used by us the short scar may be placed along the lateral border of the breast, where it may be completely covered by the usual brassiere.

Absence of paradoxical motion: The paradoxical motion resulting from thoracoplasty necessitates the division of the collapse into stages, usually not exceeding the resection of 2½ ribs per stage. Paradoxical motion embarrasses pulmonary function and makes the cough ineffective in raising sputum. This is considered to be an important factor in the post-operative spread of the disease. There has been no instance of post-operative spread of the disease in our series of pneumonolysis and plombage.

Preservation of pulmonary function: The studies of Wright, Cournand, and others have demonstrated that extrapleural pneumonolysis interferes less with respiratory function than a comparable degree of collapse by thoracoplasty.

Compression therapy in addition to better collapse: A carefully performed pneumonolysis results not only in the stripping of the lung from the chest wall but from the mediastinum as well. The lung is then allowed a three-dimensional collapse and retraction. In addition, active mechanical compression is applied by the introduction of the lucite spheres. The compression applied to a thoracoplasty by special types of harness or apparatus is much less effective.

Decreased shock, early ambulation, decreased morbidity: The pectoralis minor is the only muscle transected in the approach used by us, and this reduces the blood loss markedly over the parascapular incision of thoracoplasty. This leads to early ambulation and accelerated convalescence.

Economic factors: Collapse of any part or an entire lung can readily be done in one stage of pneumonolysis. This results in " a reduction " of the period of hospitalisation by as much as two months, in the average case requiring the equivalent of three stages of thoracoplasty. The conservation of nursing service and hospital facilities thus afforded is appreciable. The lack of need for blood transfusion previously noted adds to the saving.

The technical difficulties encountered in pneumonolysis have been previously discussed. These make this operation considerably more difficult, and it requires much greater skill and experience on the part of the operator than does thoracoplasty. However, the technique of the operation is readily acquired by the experienced thoracic surgeon.

The unknown factor in this procedure is the ultimate fate of the lucite spheres. This only time will decide. However, our experience as reported here would indicate that a minimum of difficulty from this source may be anticipated.

Summary

(1) The use of extrapleural pneumonolysis as a non-deforming procedure to replace thoracoplasty in the collapse therapy of pulmonary tuberculosis is reviewed. The substances previously used for plombage and the criteria for such a substance are enumerated. Previous experimental studies are mentioned briefly.

(2) The type of case chosen is essentially the same as for thoracoplasty. Individual modifications are discussed.

(3) The technique for the procedure is given, and the complications encountered are reviewed.

(4) The advantages of extrapleural pneumonolysis with lucite plombage over thoracoplasty are discussed.

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MYOCARDIAL METASTASIS BY BRONCHIAL CARCINOMA AND OTHER NEOPLASMS

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While secondary involvement of heart muscle by malignant growths is probably not so rare as was at one time thought, most reports in the literature deal with only a few or even single examples. Symmers (1917) found only 5 among 298 malignant autopsies. Yater in 1931 recorded 9 heart tumours, of which only 5 were metastatic. A few years later Burke (1934) cited involvement in 14 of 327 cases post mortem, and Lymburner (1934), reviewing a much larger series, gave a figure of 52 out of 8,500 subjects with malignant growths.

In 1935 Helwig could find only 98 such cases in the literature collected from 41,000 autopsies, his own series amounting to 9 out of 1,000. Since then two large post-mortem series have been published; by Pollia and Gogol (1936), who found the myocardium involved 29 times in 1,450 cases, and by Scott and Garvin (1939), whose 1,082 malignant autopsies showed the condition in 79. In 1941 Lisa and his colleagues reviewed some of the previously reported cases and added 4 of their own. Doane and Pressman, writing in the following year, considered that in only 20 cases in the literature, including their own patient, had the diagnosis of malignancy of the heart been made ante mortem, 1 of these being a primary tumour.

The primary site of growths producing these metastases is diverse, and few organs or types of growth are not included. Sarcomata, as might be expected from their hæmatogenous dissemination, give a higher proportion of cardiac deposits, though they are rarer neoplasms. But the most noticeable feature is that the primary growth arises from a bronchus more often than from any other organ. Thus in Scott and Garvin's series (1939) 115 out of 1,082 autopsies showed bronchial carcinomata, of which 30 (26 per cent.) had produced myocardial invasion. The percentage involvement by some other growths was greater; two-thirds of 9 cases of reticulum-celled sarcoma, 6 out of 11

with lymphatic leukæmia, and half of the 10 cases of malignant melanoma. A bronchus was the primary site in 4 of the 29 cases recorded by Pollia and Gogol (1936), the kidney being the only commoner organ (six times), though there the frequency of cardiac metastases was not stated. Of the 20 cases which Doane and Pressman (1942) found diagnosed during life a bronchial carcinoma was the cause of myocardial metastases in 6.

Symptomatology

The clinical syndromes which may be produced by growths in the heart are, as is to be expected, varied and for the most part non-specific. Fishberg (1930) pointed out the following types:

(1) Mediastinal tumour with pressure symptoms.
(2) Myocardial failure of obscure origin.
(3) Mitral or tricuspid stenosis, or aortic regurgitation.
(4) Recurrent hæmorrhagic pericarditis.
(5) Angina, or Stokes-Adams attacks.

He reported 3 cases all in men over the age of sixty-four, each emphasising the importance of arrhythmia as a prominent clinical feature.

(*a*) Carcinoma of right main bronchus involving both auricles. Auricular fibrillation developed three days before death.
(*b*) Carcinoma of right main bronchus with involvement of right auricle. Two paroxysms of auricular fibrillation occurred in the two months preceding death. Coronary sclerosis was also found at autopsy.
(*c*) Reticulum-celled sarcoma with deposits in right auricle and left ventricle. Auricular flutter and angina for three days were present a fortnight before death. Coronary sclerosis was also present.

Yater (1931) thought that neoplastic cardiac involvement might be suspected during life from certain indications.

(*a*) Heart block or other arrhythmia without apparent cause.
(*b*) Mitral stenosis without history of rheumatic fever.
(*c*) Any tricuspid or acquired pulmonary stenosis.
(*d*) Hæmorrhagic pericarditis.
(*e*) " Cardiac dysfunction " in a known malignant case, without apparent cause.

The symptomatology referred, of course, to both primary and secondary tumours; types (*b*) and (*c*) might normally be of the pedunculated variety. He also indicated the mimicking of subacute bacterial endocarditis by malignant emboli.

The Occurrence of Arrhythmia

Reference has just been made to Fishberg (1930), who first emphasised the occurrence of arrhythmia as a possible diagnostic point. Pollia and Gogol (1936) noted irregular cardiac rhythm to have been found in 2 out of their 29 cases, while tachycardia of 110 or more per minute was found in a further

10. Similar tachycardia of sinus origin was also remarked upon by Lisa *et al.* (1941) in 2 out of their 4 reported cases. Paroxysmal arrhythmia was noted by Kamerling and van Nieuwenhuizen (1936) in 8 out of 36 patients with bronchial carcinoma, but was attributed by them to malignant involvement of a vagus nerve in the mediastinum. Myocardial metastasis occurred 79 times in the 1,082 malignant autopsies collected by Scott and Garvin (1939); 5 patients had shown arrhythmia, all but 1 of these having a primary bronchial growth, and 3 having malignant auricular involvement.

Present Investigation

It was primarily in order to correlate the occurrence of arrhythmia with auricular invasion by neoplasm that the present series was collected. Twenty cases were studied, either because arrhythmia was present or because myocardial involvement by growth was found post mortem. They occurred in an unselected series of 148 cases diagnosed as bronchial carcinoma, 98 of which were proved by autopsy and a further 11 by biopsy, bronchoscopic or otherwise; 7 of the patients have previously been the subject of a short report (Pearson, 1944).

The relevant features of these 20 cases have been summarised in Table I: it can be seen that in the last 3 patients the arrhythmia present was considered not probably due to the presence of neoplasm. Although two of them had hæmorrhagic pericarditis, experience of other autopsies in the series has shown this to be so relatively common that it cannot in itself be taken as evidence of myocardial invasion. The third case, unproved histologically, originally had a left pleuro-pericardial rub which led to the performance of an electrocardiogram, but a three-year " cure " rendered cardiac involvement unthinkable. These three cases are included mainly for the sake of completeness, but also in order to mention that No. 19 was wrongly diagnosed during life as having malignant myocardial involvement.

There remained 17 patients, in 15 of whom malignancy of the myocardium was proved post mortem, 1 at thoracotomy (as previously reported by Rusby and Thompson in 1943), and 1 in whom it was assumed on the evidence of a fistula between the right lower lobe bronchus and the œsophagus, bronchoscopic biopsy being positive.

Of these cases, Nos. 1-17, occurring in chronological order, 11 had shown the presence of some cardiac arrhythmia during life; 5 had paroxysmal auricular fibrillation, 2 had established auricular fibrillation a few days before death, 2 showed auricular flutter, 1 had paroxysms of both flutter and fibrillation, and 1 exhibited paroxysmal premature systoles. In only one case (No. 6) classed as flutter was the diagnosis in doubt, as an electrocardiograph was not made; clinically there had been a gross tachycardia constantly regular between 136 and 154 per minute for three weeks, quite out of proportion to any pyrexia which occurred.

In none of these patients was there any rheumatic history, nor was there clinical or autopsy evidence of rheumatic, hypertensive or degenerative heart disease. The average age of those with arrhythmia was 54·7 years, varying from 37 to 66 years, while of those without arrhythmia the average was 44

TABLE I

No.	*Case*	*Age*	*Sex*	*Primary bronchial growth site*	*Histology*	*Heart chamber involved*	*Myocardial invasion diagnosed by*	*Arrhythmia*	*Remarks*
1	I.C.	59	M.	L. upper	Squamous	L.A.	P.M.	Paroxysmal premature systoles	
2	N.B.	62	F.	R. upper	Squamous	R.A. and L.A.	P.M.	Paroxysmal auricular fibrillation Paroxysmal auricular flutter	6 attacks 2 attacks
3	E.H.	51	M.	R. main	Oat and spheroidal	L.A.	*P.M.	Paroxysmal auricular fibrillation	
4	A.I.	37	M.	R. lower	None	R.A.	Thoracotomy	Paroxysmal auricular fibrillation	Numerous attacks during 15 months
5	F.C.	52	M.	R. lower	Squamous	?L.A.	Clinical findings	Paroxysmal auricular fibrillation	Broncho-œsophageal fistula. No P.M.
6	D.B.	48	F.	L. lower	Oat	L.A.	P.M.	Auricular flutter	Regular 136-154. No E.C.G.
7	R.P.	59	F.	R. upper	Oat	R.A. and L.A.	*P.M.	Paroxysmal auricular fibrillation	Congestive heart failure at onset
8	E.W.	60	M.	L. lower	Oat	R.A., L.A. and L.V.	P.M.	Auricular fibrillation	Onset 3 days before death
9	A.S.	36	M.	R. lower	Oat	R.A. and L.A.	P.M.	None	Tachycardia 100-110
10	E.L.	43	M.	L. upper	Squamous	R.A. and L.A.	*P.M.	Auricular flutter (2 : 1 and 3 : 1)	
11	R.D.	42	M.	R. upper	Oat	R.A. and L.A.	P.M.	None	Tachycardia 82-120
12	F.B.	37	M.	R. upper	Giant and spheroidal	L.A.	P.M.	None	
13	S.H.	55	M.	L. main	Oat	L.V.	P.M.	None	
14	A.C.	65	M.	L. main	Adeno-	L.A.	P.M.	Auricular fibrillation	Onset 7 days before death
15	C.M.	66	M.	R. lower	Oat	L.A.	P.M.	Paroxysmal auricular fibrillation	Numerous attacks
16	J.B.	44	M.	L. main	Oat	L.A.	P.M.	None	
17	W.D.	49	M.	L. lower	Squamous	L.A.	P.M.	None	
18	C.T.	66	M.	L. upper	Squamous	None	(P.M.)	Paroxysmal auricular fibrillation	Hypertensive heart disease—hæmorrhagic pericarditis
19	H.G.	55	M.	L. upper	Squamous	None	(P.M.)	Paroxysmal auricular flutter and fibrillation	Coronary atherosclerosis. Hæmorrhagic pericarditis
20	E.V.	59	M.	L. upper	None	None	—	Branch bundle block	" 3-year cure " by deep X-ray therapy

L.A.—Left auricle. R.A.—Right auricle. L.V.—Left ventricle. P.M.—Autopsy.

* Diagnosed also ante mortem.

years; in the latter group 2 were noted to have had an unduly persistent tachycardia around 100 per minute.

It can be said that, by analogy with other cases, the diagnosis of malignant cardiac involvement was made on clinical grounds ante mortem correctly in three cases (Nos. 3, 7 and 10), and that there was strong presumptive evidence without proof of such a diagnosis in Case 5. None of the other manifestations mentioned in the literature were particularly noted during life in the present series, except that one patient (No. 7) had congestive heart failure in addition to auricular fibrillation as an initial symptom, and autopsy showed some coronary sclerosis.

The series was composed of 14 males and 3 females: the primary growth was left-sided in 8 and right-sided in 9 patients. Involvement of the heart chambers occurred as follows:

Left auricle fourteen times, right auricle seven times, and left ventricle twice; the right ventricle was never involved. The neoplasm was classified histologically as squamous in 5 cases, oat-celled in 8, and oat- and spheroidal-celled, giant- and spheroidal-celled and undifferentiated adenocarcinoma once each.

Thus of 148 patients diagnosed as bronchial carcinoma, 17 (11·5 per cent.) were found to have malignant invasion of the myocardium, which was considered to be responsible for an arrhythmia occurring in 11 of their number, and possibly also for an unexplained degree of sinus tachycardia in a further 2 cases. Advancing age appeared to increase the liability to onset of such arrhythmia, and it is realised that minor degenerative changes in the coronary arteries or their smaller divisions might have explained, or at least contributed to, this finding. Serial sections of the coronary branches were not studied as a routine microscopically, but as previously indicated there was no gross macroscopic evidence of coronary disease in any of the 17 cases except one, and only 3 out of the remaining 131 patients in the series were noted to have an arrhythmia. Some degree of myocardial degeneration was a fairly common finding at autopsy and was attributed to the cachectic state often combined with pulmonary sepsis; it was not noted to have occurred more frequently in the arrhythmic group. From these observations it was felt justifiable to assume that the malignant cardiac invasion was at least the major factor in the production of abnormal rhythm, a point which seems to have been accepted without question by most other authors on this subject.

Myocardial Metastasis from Non-bronchial Neoplasms

The 98 autopsies on bronchial growths occurred in a consecutive five-year series of 456 cases of malignant disease of various types examined post mortem, thus forming over one-fifth of the total. This high incidence could be accounted for by the presence in the hospital of a radiotherapy unit, combined with the close proximity of a thoracic surgical unit, which provided a fair number of inoperable cases.

It is realised, therefore, that truly comparable figures cannot be produced from the present series regarding the frequency with which bronchial carcinomata and other neoplasms produce cardiac metastasis; but with this reservation

there are some points of interest to be gleaned from a study of Table II, which shows all the other cases of cardiac metastasis and the total of each type of growth in the autopsy series. The only omission from the list is three squamous-celled growths from different primary sites, which of course formed a very small percentage of all such cancers treated at the radiotherapy unit, relatively few of them coming to autopsy.

It is first remarkable that the bronchial growths were responsible for myocardial invasion almost as frequently as all the other neoplasms together. However, it can be seen that some of the neoplasm types, though small in number, notably the sarcoma group and the melanomata, invaded heart muscle relatively more frequently than did bronchial carcinoma; the figures agree roughly with those collected by Scott and Garvin (1939), as mentioned earlier.

It is perhaps also noteworthy that in over 70 necropsies on cancers arising

TABLE II

Type of growth	*Number producing cardiac metastasis*	*Total number in autopsy series*
Malignant melanoma	3	4
Lymphosarcoma	3	10
Reticulum-celled sarcoma	3	10
Retroperitoneal sarcoma	1	3
Sarcoma of vagina	1	1
Carcinoma of kidney	1	1
Carcinoma of parotid	1	2
Carcinoma of gall bladder	1	2
Carcinoma of œsophagus	1	12
Carcinoma of breast	1	27
Carcinoma of cervix	1	36
Teratoma of testis	1	10
Lymphadenoma	1	17
Total	19	

from the alimentary tract below the œsophagus no cardiac metastasis was found.

Only one patient in the non-bronchial group was reported during life as having arrhythmia, and this was one of the lymphosarcoma cases, with auricular fibrillation. This low incidence would seem to be explained by the fact that in half the cases the myocardial involvement was ventricular only, while in a further quarter it was of multiple generalised metastatic type, in contrast with the bronchial carcinoma series.

Conclusions

From a study of cases recorded in the literature and those in the present series the following points emerge:

(1) Bronchial carcinoma produces malignant involvement of the myocardium with the greatest *absolute* frequency of any type of growth.
(2) The reason for this is twofold; because it is a relatively common type of neoplasm and because of the anatomical proximity of the primary

growth or the secondary glands to the auricles, particularly the left one.

(3) The *percentage* of myocardial metastasis is actually higher in some of the rarer neoplasms, such as malignant melanoma and some sarcomata.

(4) The auricular involvement by bronchial carcinoma is by direct invasion from continuity of growth. This can also be expected to occur in some other types, such as mediastinal lymphosarcoma and œsophageal carcinoma, but naturally from most non-bronchial primaries the metastasis is blood-borne.

(5) Cardiac arrhythmia caused by auricular invasion is therefore much the most probable clinical feature to draw attention to myocardial invasion by broncho-carcinoma during life.

(6) Arrhythmia is extremely rare in myocardial metastasis from any other growth, as is to be expected from the much smaller frequency of auricular involvement. Correct ante-mortem diagnosis of cardiac deposits from these growths is more likely to rest upon one of the other clinical features which have been quoted.

It is evident, therefore, that while the subject of involvement of heart muscle by neoplasm is admittedly largely of academic interest, the diagnosis is most likely to be made clinically in the presence of a bronchial carcinoma, and, if so made, it should certainly modify any attempt at radical treatment, whether surgical or radiotherapeutic.

Summary

(1) The literature on malignant metastasis to heart muscle is briefly reviewed.

(2) A series of 148 cases diagnosed as bronchial carcinoma, 98 being proved by autopsy, were studied at an E.M.S. hospital. Malignant cardiac involvement occurred in 17 (11·5 per cent.); in approximately two-thirds of this number arrhythmia had occurred, which was considered attributable to the invasion of one or both auricles by growth. In a proportion of cases this diagnosis can be made ante-mortem with a fair degree of certainty.

(3) The incidence of myocardial involvement and arrhythmia from bronchial carcinoma is contrasted with their occurrence in other types of neoplasm.

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SEROUS TUBERCULOSIS IN EAST AFRICAN NATIVES

BY S. R. WOOD

PULMONARY tuberculosis in African negroes differs in many ways from that in Europeans. The differences are well known, but there are still enough points of disagreement to make investigations worth recording. This is particularly true of the disease when affecting serous membranes, and this aspect of it forms the basis of the following short account.

CLINICAL MATERIAL

The men were between 18 and 30 years of age and were treated at the East African Command Chest Centre between 1944 and 1946.

Sixteen had primary glandular tuberculosis with an effusion, 125 showed primary unilateral pleural effusion and another 28 developed tuberculous polyserositis or intermediate stages in the full development of that condition. The series thus totalled 169 patients.

Although it is difficult to classify cases which represent the flow and arrest of an evolving disease, yet these three groups were distinctive enough to form a convenient basis for clinical description.

CLINICAL TYPES AND MANIFESTATIONS

1. *Primary Glandular Tuberculosis with Pleural Effusion*

Table I shows that these 16 cases comprised part of a total of 36 cases of primary glandular tuberculosis treated at the Centre.

TABLE I.—PRESENTING ILLNESS: PRIMARY GLANDULAR TUBERCULOSIS

Course of Illness.	*Number.*	*Deaths.*
Confined to glands	16	0
Developed unilateral pleural effusion ..	16	0
Generalised miliary spread with polyserositis	3	3
Generalised miliary spread	1	1
Total	36	4

These 16 cases of pleural effusion usually gave a history of fever of several weeks' duration, with or without symptoms referable to the chest, commonly generalised pain and cough, sometimes with a little sputum. Temporary slight blood-staining of the sputum was reported in a few cases and was suspected of being due to tracheobronchial involvement, but as many reached the Centre

from overseas after the acute stage was over, early bronchoscopic confirmation is lacking and later bronchoscopy did not reveal it. Some showed no localising symptoms or signs and were labelled pyrexia of unknown origin; others showed signs of local consolidation and were diagnosed as pneumonia in spite of a not unduly raised respiration rate and a low white cell count. X-rays revealed enlarged hilar gland shadows, occasionally with hilar flare or definite lobar or segmental collapse.

No cases of concomitant parenchymatous disease were included in this series, and the sputa and, in some instances, the gastric washings were persistently negative for acid-fast bacilli.

The associated pleural effusion appeared at the onset in 7 of these cases; in the remaining 9 it did not appear until the illness had lasted on the average three or four months. Although a few cases passed through an uneasy period of instability with the veiled threat of miliary spread, as reflected in the temperature and weight chart, yet the majority ran a protracted but benign course with early clinical improvement and absorption of the effusion, but with persisting enlarged hilar gland shadows on X-ray for many months after clinical activity had subsided.

A good example of this was seen in CASE 1, where the illness began with fever and malaise, an absence of abnormal signs and of any confirmatory laboratory evidence for other sources of pyrexia, and with an infiltrative flare around the right inferior tracheobronchial glands. After three weeks' fever this man improved, and not until ten weeks later did his fever return, with a small right pleural effusion. This slowly resolved and the temperature finally settled again after six weeks. In spite of improvement in general condition, weight gain and absence of symptoms, an X-ray nine months later still showed an abnormal shadow in the right middle zone consistent with partial collapse of the right middle lobe.

2. *Primary Pleural Effusion*

Table II shows the fate of cases presenting as primary serous tuberculosis in contrast with the primary glandular forms (Table I).

TABLE II.—PRESENTING ILLNESS: PRIMARY SEROUS TUBERCULOSIS

Course of Illness.	*Number.*	*Deaths.*
Unilateral pleural effusion	125	0
Consecutive effusions of polyserositis type	11	1
Polyserositis	14	1
Total	150	2

Effusions were right-sided in 55 per cent. and the mode of onset in 60 per cent. was subacute with fever, pain in the chest and dry cough coming on over a period of one or two weeks. In about 20 per cent. the onset was insidious with general malaise and minimal local symptoms, and in another 20 per cent. there was an acute onset with high fever, severe pleuritic pain, restricted cough and dyspnœa. These cases were invariably diagnosed as lobar pneumonia, so close was the resemblance in the early stages. Where laboratory facilities and

X-rays were not available the diagnosis was often only suspected when the patient failed to respond to chemotherapy. Complete re-examination of the chest in 24 to 36 hours clinched the diagnosis in most cases of quickly developing effusion.

On examination the more acutely ill cases usually showed some dulling of the skin lustre, evidence of recent weight loss and a mild degree of anæmia, although mainly the general condition remained good. In 12 per cent. there was enlargement, usually unilateral, of the supraclavicular glands, just external to the sternomastoid belly, and occasionally of the cervical groups. In one or two instances the cervical glands dominated the clinical picture and either reached the stage of surgical intervention several months before the onset of the pleural effusion or, appearing with it, soon overshadowed the chest condition. Moreover, in sharp contrast with the relatively benign course in European children, they always carried a bad prognosis, indicating generalised tuberculosis and death within twelve months. Significant axillary adenitis was very rarely encountered.

X-ray appearances were typical, and in this group hilar gland enlargement was very seldom demonstrable.

Diagnostic needling of the chest was the routine, but culture and/or guinea-pig inoculation of the fluid in the few cases in which it was done was negative for acid-fast bacilli. The most modern culture techniques were not available.

Some of the cases had fluids of over 4 per cent. protein content which were excessively sticky and tended to clot spontaneously in the test tube. Because of subsequent dry taps in cases where clinical and X-ray evidence of fluid persisted, it was assumed that similar spontaneous clotting of the whole fluid mass occurred in the pleural cavity, followed by slow absorption and organisation of thickened pleura.

In the vast majority the cells were predominantly lymphocytes. In 5 instances of large effusions of insidious onset a polymorph reaction was found, but these fluids did not become frankly purulent and the finding appeared to be of no prognostic significance.

Regular sputum examinations were negative for acid-fast bacilli. The Mantoux reaction (1/1,000) was positive in every case, and an occasional severe reaction with vesiculation suggested that a higher dilution might have sufficed. The white blood count was mainly within normal limits.

General Management, Treatment and Control

The course of the illness was controlled by weighing and screening examination weekly, a film every month or more frequently if there was a fresh turn in the illness, and regular blood sedimentation rate examinations.

The B.S.R. varied within wide limits and no reliance was placed on any but serial readings over several months. The average figure at the onset of the illness was 40 mm./hr., falling to 15 mm./hr. after 5 months. There was no correlation between the figures and the clinical findings except that the final readings were slightly higher in the cases showing grossest residual pleural thickening. It was regarded as a useful numerical index of progress if taken strictly in conjunction with the general clinical and radiological picture.

The most significant means of control was the weekly weight gain as a token of improvement and healing, and in this group the average gain during a stay in hospital of 4 to 5 months was between 9 and 10 lbs.

The general management was perforce along different lines from that adopted in this country. Once over the initial acute stage, it was virtually impossible to enforce bed rest, but sedentary habits were encouraged by occupational therapy. Organised breathing exercises were cautiously prescribed in carefully selected cases with minimal and obviously quiescent lesions, and no untoward effects were noted.

As to the effusion itself, no hard-and-fast policy was laid down, so that about half the cases were treated by single or repeated aspirations, while the other 50 per cent. were allowed to absorb without intervention. In comparing the two series, in so far as they are comparable, significant differences were found only in residual pleural effects.

Table III shows a percentage analysis of cases in the two series graded into their clinical and radiological degrees of residual pleural thickening. Minor degrees, such as diaphragmatic peaking, were determined radiologically; the grosser degrees of thickening, with chest deformity, a drooping shoulder and scoliosis, were evident clinically.

TABLE III.—RESIDUAL PLEURAL EFFECTS

	Management.		*Average Per cent.*
	Aspiration Per cent.	*Absorption Per cent.*	
Contraction and deformity ..	9	7	8
Thickened pleura	71	56	63·5
Minimal pleural thickening ..	19	32	25·5
Normal	1	5	3

Thus an average of over 70 per cent. of both groups were left with considerable pleural thickening, to which references in the literature are few. Erwin (1944) noted it in only 1 per cent. of English adults, whereas Feldman and Lewis (1946) in U.S.A. reported it in 52 out of 59 cases. They causally associated it with highly proteinous spontaneously clotting pleural fluids, and it is also possible that there are as yet unknown probably constitutional factors at work in its production. In one of these African cases pleural thickening could be detected at diagnostic aspiration six weeks after the first symptoms, so that the process may well be established before the acute stage is over. Replacement pneumothorax has not, in the opinion of most observers, been found to prevent it, and this supports the view that the pleural reaction is determined at a very early phase of the illness.

The criteria of temporary arrest in this group were as follows: (i) Normal temperature for three weeks; (ii) absorption of fluid; (iii) significant weight gain; (iv) progressive fall in the B.S.R.; and to attain these an average stay of 4 to 5 months in hospital was necessary. In African soldiers, many of whom had been separated from their families by long sojourn overseas, it required much patient handling to get even these simple desiderata fulfilled, far as they fell short of accepted ideals.

Prognosis and the Development of Polyserositis

The immediate prognosis in these cases was exceptionally difficult to determine, depending upon unknown racial and personal constitutional factors, no less than on the extent and activity of the underlying tuberculous lesions and on the liability to blood spread. It is well known experimentally that serous effusions in several body cavities can be produced by the introduction of tuberculin into one cavity. It is also probable that slow progress of infection through the long chain of glands is accompanied by a transient bacteræmia; so that although 125 cases tended in fact to run a benign course with apparent arrest, yet the clinical behaviour of others suggested that, whatever the mechanism of extension, the infection was still smouldering.

Table IV abstracts from Tables I and II the type and course of the 28 cases of incomplete or total polyserositis.

Table IV

Presenting Illness.	*Course of Illness.*	*Number.*	*Deaths.*
Primary glandular tuberculosis	Generalised miliary spread with polyserositis	3	3
Primary serous tuberculosis	Consecutive effusions of polyserositis type	11	1
Primary serous tuberculosis	Polyserositis	14	1
	Total	28	5

Here we are considering those presenting as primary serous tuberculosis. In 11 of them what appeared to be a simple unilateral effusion was followed, after an interval of 3 to 18 months, by an effusion on the opposite side, and in 3 instances by a pericardial effusion. They ran a relapsing chronic course with a low intermittent pyrexia, some degree of anæmia, a dull skin, little or no weight gain, persistently raised B.S.R. and slow resolution of any demonstrable primary foci such as enlarged hilar glands. Clinically these could be classified as an intermediate stage in the development of polyserositis, and in 10 out of 11 the disease again became arrested after absorption of the second effusion and of the pericardial fluid. In the remaining case miliary dissemination occurred.

A further 14 cases showed the fully developed picture of tuberculous polyserositis. Nine of these started as unilateral effusions, but in 7 of them ascites, in 5 contralateral effusion, and in 2 instances pericardial effusion developed in from 1 to 6 months. The remaining 5 cases presented as ascites with or without pleural effusion. There was also 1 death from miliary spread (tuberculous meningitis).

Case 2 is a typical example of this group. The illness began with fever, pain in the left chest, cough and signs of a right pleural effusion. This was aspirated, and had almost resolved two months later, with improvement in the general condition, when the patient again became acutely ill and developed a moderate ascites, followed during the next four weeks by a pericardial effusion and a small left pleural effusion. A further improvement then set in, and two months later the temperature had settled and the effusions in all cavities were slowly absorb-

ing. He was observed for a further six months, and when no relapse occurred he was discharged with evidence of bilateral pleural thickening and no detectable residua in pericardium or abdomen.

To complete the picture of polyserositis one must briefly mention the three cases in which it arose during the course of a primary glandular tuberculosis which progressed to miliary spread.

These started as a typical glandular syndrome, but the serous cavities later became involved and the illness pursued an unremitting course with sustained high fever, dyspnœa, tachycardia, rapid loss of weight, anæmia, and death from generalised disease within 6 to 9 months of the onset.

Involvement of Serous Cavities in Polyserositis

The Pleural Cavities.—Of the 28 cases, 20 presented as a unilateral effusion, and a contralateral effusion followed in a varying period up to 18 months in 15 instances.

The pericardium was affected in 8 out of the 28 cases and in 4 of the 5 fatal cases in the series.

In negro races pericarditis (usually with effusion) is nearly always secondary to tuberculous mediastinal glands. It is most commonly seen as part of the polyserositis syndrome, although it can arise as a blood-borne infection early in miliary dissemination, and its appearance in a case of active and apparently progressive disease always worsens the prognosis. Those that recover tend to develop constrictive pericarditis with associated congestive cardiac failure, as in 1 case in this series. The physical signs of massive pericardial effusion are so dramatic that they often dominate the clinical picture. Treatment by aspiration with or without the induction of a pneumopericardium did not seem to have any beneficial local effect.

Abdominal glandular and serous tuberculosis occurred in 13 cases, characterised by abdominal pain and moderate ascites, while enlarged glands occasionally became palpable as the ascites subsided. The ascites and the abdominal gland masses can so melt away, leaving an apparently normal abdomen, as to suggest, along with the pathological findings in fatal cases, that glandular involvement is much more generalised than careful examination reveals, and that such a silent adenopathy may indeed underlie the most seemingly benign cases of pleural effusion. It is clearly miliary dissemination that tolls the fatal knell.

Discussion

Tuberculous infection in the African varies directly with opportunities for outside contact and inversely with tribal isolation. Wilcocks (1935) in a Mantoux survey of an area of Tanganyika Territory having trading connections with the coast found that approximately 50 per cent. of the normal population gave a positive reaction. Many adult natives may have received their primary infection while serving under war conditions in overseas theatres with a known high rate of indigenous tuberculosis.

The basic pathological change in the infected African adult is found in the tracheobronchial lymph nodes—an adenitis which often leads to gross enlargement and extensive caseation. Although white races show a comparable

glandular response in childhood, they do not usually have such a marked glandular reaction when the primary infection occurs in adult life. Most workers who have compared the evolution of tuberculosis in whites with that in negroes under similar environmental conditions believe that this difference in response depends upon a difference in racial immunity.

Oswald (1946) in a recent study of pulmonary tuberculosis in African native troops in the Middle East found mediastinal cervical or abdominal glandular enlargement in 96 per cent. of 50 fatal cases studied at post-mortem, about half of which had progressed to caseation. The 416 cases in his series fell into four clinical groups, and although the majority showed acute parenchymatous disease, 31 per cent. of the total presented as either glandular or serous tuberculosis. In East African troops alone these two groups accounted for no less than 46 per cent. of the total. This interesting observation suggests that even within the Bantu and allied tribal groups the response to tuberculous infection varies.

The march of infection from the tracheobronchial lymph nodes through the glandular chain is usually relentless and extensive. It reaches upwards occasionally as far as the supraclavicular group and downwards to the para-aortic and mesenteric groups, with widely scattered miliary nodes in internal organs. Polyserositis and generalised fatal tuberculosis are thus a constant hazard.

Owing to this marked glandular reaction, a pleural effusion may possibly arise not only from a primary subpleural lung focus or scattered pleural tubercles, but also from the tracheobronchial glands themselves, either by direct extension or by rupture of caseous material from a gland abscess.

It has become evident in this clinical study that the ordinary primary unilateral pleural effusion, although accounting for three-quarters of the cases, stands not so much as an isolated and comparatively localised incident, as it does in the young European adult, but is closely linked with the whole problem of the slow continuous or intermittent evolution of primary tuberculosis. It may appear at any time during the post-primary stage, most commonly about six months after the primary infection, and it has three distinctive and important tendencies which are unusual in European adults. First, it may arise as an incident in what is predominantly a glandular syndrome with a relatively good prognosis. Secondly, it may develop, either as a continuous illness or by stages with quiescent intervals of many months, into a polyserositis. And, further, at any point, but more especially where gland involvement is extensive, there may be an acute miliary dissemination of the infection.

By contrast, in a recent report of 190 cases of primary pleural effusion in young English adults, Thompson (1946) noted hilar gland enlargement in only 8 cases, abdominal tuberculosis and pericarditis in only 3 cases and 1 case respectively, while not once did miliary spread occur.

Twenty out of these 28 African cases of polyserositis began as a unilateral pleural effusion indistinguishable from the 125 cases which ran a benign course. Those which became arrested after absorption of the consecutive pleural and pericardial effusions were relatively well in between their acute exacerbations; those which progressed to complete polyserositis were seldom free from evidence of active low-grade infection.

Nevertheless, these results at least demonstrate that primary tuberculosis is not necessarily a lethal infection, and that improvement, and probably arrest, can occur with encouraging frequency in negro races.

Summary

1. One hundred and sixty-nine cases of tuberculous serositis in East African native troops are reviewed clinically.

2. The response to infection and the pathology are characteristic of primary infection in adult life among negro races.

3. The most common finding was an isolated pleural effusion, often a sign of a disseminated infection progressing to polyserositis or arising in the course of a primary glandular syndrome. In these last two groups there were 5 deaths.

4. Prognosis was shown to depend not so much on the extent of the infection as on the unpredictable liability at any stage to acute miliary dissemination.

5. A high incidence of gross residual pleural thickening was found.

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THORACOPLASTY IN THE TUBERCLE GRAVIDÆ

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Introduction

The problem of pregnancy in the tuberculous woman bristles with difficulties. Popular opinion favours the view that only in exceptional instances should therapeutic interruption of the pregnancy be done. Along with this growing tendency to regard the chest condition as being of primary importance and the pregnancy secondary in significance, the indications for collapse therapy have widened. From the results of investigations carried out on twenty-six tuberculous gravidæ receiving artificial pneumothorax, Cutler (1944) subscribed to the view that the risks run by the mother varied with the quality of the lung collapse obtained by treatment. Theoretically, at least, thoracoplasty should be considered as a possible choice in treatment, although

the relevant literature cites only four instances where thoracoplasty has been done during pregnancy (1940). Accordingly the following example was thought to be worth recording:

Clinical Report

CASE H.M. Aged 32 years. This patient, three and a half months pregnant, was admitted to Robroyston Hospital, Glasgow, on June 6, 1947. She gave a history of some slight staining of sputum fourteen days prior to admission. Morning cough was present, but was not troublesome. Sputum was scanty and mucoid in character.

In 1941 she had routine sanatorium treatment for active bilateral disease. Attempts to establish a left artificial pneumothorax at that time met with no success, and she was treated by rest and a course of gold. She responded well at the time to this conservative treatment, and was discharged fit one year later in 1942. During the following five years, 1942-47, she enjoyed remarkably good health.

On her admission to the maternity unit of this institution her general condition was excellent. Clinical examination of the chest showed that the lung lesion was bilateral in distribution and fairly fibroid in type, but a cavity was thought to be present in the left upper zone and she had a positive sputum. Radiologically the disease affected the upper third of the right lung and upper half of the left, with cavitation in the left apex. Clinical investigation of other vital organs did not disclose any abnormalities. Pelvic examination confirmed the pregnancy, but failed to reveal any obvious cause for two previous miscarriages in 1945 and 1946.

A very definite and not unnatural reluctance on the part of the patient to have the pregnancy terminated forced the issue, as far as treatment for the combined conditions was concerned. Thoracoplasty for the left-sided lesion suggested, and accepted willingly by the patient. Following induction by sodium pentothal (0·5 gm.) intravenously and under general anæsthesia, maintained by nitrous oxide, oxygen and trilene administered endotracheally, a two-stage thoracoplasty was performed. The first stage was done on June 13, 1947, the second on June 27, 1947. Seven ribs in all were removed. No undue bleeding was noticed during these operations, both of which were well tolerated by the patient. Sand pillows to the chest on the third day following operation reinforced the lung collapse initiated by thoracoplasty.

On December 2, 1947, under spinal anæsthesia, patient was delivered by forceps, after preliminary episiotomy, of a live male child weighing 6 lb. 16 oz. Placenta and membranes were expressed completely, spontaneously, ten minutes later. The mother's condition after delivery was excellent. The puerperium was normal and uneventful.

Ten weeks following the confinement mother and child reported for examination. X-rays taken of the mother's chest showed no deterioration of the lung lesion. Fluorescent microscopy failed to detect tubercle bacilli in the sputum. The child had gained 4 lb. in weight, and X-rays of its chest showed no evidence of pulmonary disease and no enlarged mediastinal glands.

Discussion

This patient illustrates the technical feasibility of thoracoplasty during pregnancy, and the evidence of sputum conversion and cavity closure points to its success. Moreover, the importance for the subsequent welfare of the

child is a vital matter. Both the operative procedures and the subsequent convalescence were quite uneventful; and apart from some slight dyspnœa towards the end of the second stage when low forceps were applied to facilitate delivery, labour was normal.

If, as this patient shows, thoracoplasty on the tuberculous gravidæ is at times not only feasible but desirable, the time of election for operation might well be the first trimester—preferably at a time corresponding to the intermenstrual period.

Summary

A young woman with bilateral pulmonary tuberculosis, including a cavity in her left upper lobe with a positive sputum, was treated by a partial left thoracoplasty when three and a half months pregnant. She made an uneventful recovery with sputum conversion, had a normal delivery of a healthy child, and remained well afterwards.

My thanks are due to Mr. J. A. Bingham, who did the operation, and to Dr. W. C. Armstrong, who supervised the confinement.

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NOTICES

NATIONAL ASSOCIATION FOR THE PREVENTION OF TUBERCULOSIS

NAPT PRIZE FOR ESSAY ON COLONIAL TUBERCULOSIS

A prize of one hundred guineas will be awarded by the Council of the NAPT for an Essay on "The Control of Tuberculosis in a British Colony." The competition is open to doctors (of either sex) in the British Colonial Medical Service who are of not more than ten years', or less than five years', medical standing, of which at least three years have been spent overseas in a medical capacity.

Competitors should describe their own proposals for a practical scheme for the clinical, social and administrative control of tuberculosis, either in the British Colonies as a whole or in one or more of them separately. Writers should give their own opinions based on personal experience of public health and anti-tuberculosis work.

Essays should be sent to Dr. Harley Williams, National Association for the Prevention of Tuberculosis, Tavistock House North, Tavistock Square, London, W.C.1, to arrive not later than March 1, 1949. The award of the prize will be notified at the NAPT Commonwealth and Empire Health and Tuberculosis Conference in London in July 1949. Essays sent in shall become the property of the NAPT, and any of them may be published at its discretion in the author's name.

NAPT MEDICO-SOCIAL SECTION

THE Inaugural Meeting of the NAPT Medico-Social Section was held on Friday, May 7, 1948, at 5 p.m., at the British Medical Association House, Tavistock Square, London, W.C.1. Sir Robert Arthur Young, C.B.E., Vice-Chairman of Council of the NAPT, presided, and Mr. Anthony Greenwood, M.P., Member of Council, addressed the meeting on "Social Aspects of Tuberculosis."

The Section is open to members of the NAPT who are professionally engaged on social work for the tuberculous, whose names are approved for Section membership by the Committee of the Section; but an invitation to the Inaugural Meeting was extended to all who are interested in this work.

A preliminary meeting to form the Section was held on January 30, at which the following officers were elected:

Chairman:	Miss M. S. Coltart.
Vice-Chairman:	Miss M. Talbot Kelly.
Hon. Secretary:	Miss L. J. Grout.
Executive Committee:	Miss M. Baptie.
	Miss M. Craven.
	Miss A. Hill.
	Miss C. Milner.
	Miss R. Raine.
	Miss A. Topley.
	Miss M. Wailes.

JOINT TUBERCULOSIS COUNCIL

THE Joint Tuberculosis Council at their meeting in February received with pleasure a report that the Ministry of Health had increased the fuel allowance for tuberculous persons by 1s. per week for period January to April 1948. This concession was the direct result of representations made to the Ministry by the Council.

Correspondence with the Ministry of Health regarding the inadequacy of the powers contained in Clause 5 of the National Assistance Bill as regards the needs of tuberculous persons was reported. The Ministry's view was that in so far as Clause 5 was inadequate, action could be taken through the National Assistance Board and through local health authorities. The Council, however, do not regard this as entirely satisfactory, and hope that the position will be clarified on the third reading of the National Assistance Bill.

The Council continue to be interested in the dietary requirements of tuberculous persons, especially those in sanatoria, and have authorised the preparation of a memorandum on the subject for early consideration. The point at issue is the inadequacy of the present ration allowances for sanatorium patients in comparison with those of other population groups, nearly all of whom have access to food sources—*e.g.*, canteens, school meals, etc.—not available to the sanatorium patient.

The main subject of the February meeting, however, was the action of various Regional Hospital Boards in deputing the oversight of regional tuberculosis work to medical officers charged with other duties. An instance was mentioned of the appointment of a medical officer in one region to supervise infectious diseases hospitals as well as the tuberculosis service, also an advertise-

ment for a medical officer whose work would be " mainly concerned " with tuberculosis. The Council felt that the Ministry of Health should have advised Boards to accept and implement the recommendations of the Council published last year, the chief feature of which was the appointment in every region of a regional chest physician, who should possess not only administrative experience of a high order, but also clinical ability at specialist level.

The Midland Tuberculosis Society and the North of England Tuberculosis Society were allotted seats on the Council.

REVIEWS OF BOOKS

Diseases of the Chest. By ROBERT COOPE. Second Edition. E. and S. Livingstone, Edinburgh. Price 25s.

The appearance of a second edition of this widely welcomed book has allowed Dr. Coope to make a few alterations. His account of the anatomy of the bronchial tree has now been brought into line with the more recent publications on the subject; he also describes the use of penicillin in the treatment of diseases to which it is applicable. His book remains a model of what a text-book for students should be—lucid, succinct and, in a small space, remarkably complete; moreover, it is readable and full of wisdom about more things than diseases of the chest.

Dr. Coope again keeps his collection of representative radiographs until the end of the book, deliberately excluding them from the text. It seems likely that the student would find these illustrations of more value if they were reproduced as he usually sees radiographs and not as positives. H. N.

Tuberculosis in the Commonwealth, 1947.

This is a report of the NAPT Conference held in London in July 1947, and it deals with a variety of subjects from the general aspects of tuberculosis in the Commonwealth to detailed discussions on sanatorium design, specific treatment of tuberculosis, rehabilitation and so on.

The publication makes it abundantly clear that throughout the Commonwealth shortage of hospital beds for tuberculous patients and a lack of trained medical and nursing personnel constitute a major problem, and in only small sections of some of the Dominions does there seem to be any prospect of remedying these defects within the next two decades. In New Zealand, where the care of the tuberculous has now become the responsibility of the State, housing and hospital facilities are still inadequate, and much useful work is still being carried out by voluntary organisations.

The section dealing with specific treatment of tuberculosis makes particularly interesting reading, as both preventive inoculation with B.C.G. and the vole bacillus, and curative treatment with streptomycin, are discussed at some length. The optimism shown by the American speakers at the Conference for streptomycin treatment does not seem to have been shared, so far, by British workers in this field.

Anybody interested in tuberculosis, whether from the medical or social aspect, will be able to glean much valuable information from this book, and the NAPT is to be congratulated on the excellent work it is doing both at home and abroad.

Brompton Hospital Reports, 1946, Vol. XV. Gale and Polden, Aldershot. Price 10s.

This slim volume contains nine original articles from the staff of the Brompton Hospital. All articles have appeared elsewhere in a wide variety of journals. The book opens with a tribute to the late Arthur Tudor Edwards, and this is followed by the reprinting of his paper on "Carcinoma of the Bronchus." This article, the substance of a presidential address in 1945, is a lucid exposition of the present-day position with regard to incidence, clinical picture, assessment of operability, as well as a general outline of the type of operations performed and post-operative treatment. Mr. Tudor Edwards's own operative figures are given and analysed, and indicate that only 10-15 per cent. of cases of carcinoma of the bronchus seen are ultimately operable.

Mr. Barrett has two contributions, and both live up to that high literary skill and inimitable style that we have come to expect from his pen, whether they be purely scientific writings or, as in this case, essays on subjects of medical interest. The first is the historical case of spontaneous rupture of the œsophagus observed by Boerhaave in the year 1723, in his noble patient Baron de Wassenaer. From Boerhaave's original Mr. Barrett has culled seventy closely printed pages, a detailed case history which includes the noble baron's menu, printed in full for our austerity-conditioned amazement and perhaps envy. This historical introduction is followed by a full presentation of the subject in the light of up-to-date experience; and a clinical picture is drawn with sufficient clarity to enable one to make a diagnosis in life and perhaps to fulfil the author's hope that a case diagnosed before death could be successfully treated.

The second of Mr. Barrett's contributions is an intriguing essay on the mysteries posed by an explosive and rapidly fatal cholera outbreak in Europe 100 years ago. This is presented in such an entertaining way that the word "cholera" is not mentioned until the last page.

An authoritative and profusely illustrated article on the segments of the lungs by A. F. Foster Carter and Clifford Hoyle occupies a large portion of the book. The only criticism that can be levelled at it is that the reproductions of the radiography are far from perfect. This failing, however, is counter-balanced by the clear diagrams and photographs of models and pathological specimens.

There is an interesting article by Scadding on acute benign pleurisy as seen in soldiers in the Middle East; and another by Clegg and Foster Carter on a method of detecting the tubercle bacillus by staining the bacilli with auramine and viewing in ultra-violet light in which the stain fluoresces. This is a valuable method when large amounts of material are to be examined, and the microphotograph shows how clearly the bacilli are revealed. There are also articles on pulmonary tuberculosis as seen in African native troops and on effort syndrome in native troops.

The final reprint is that of Dr. Maurice Davidson's Presidential Address to the Section of Medicine of the Royal Society of Medicine in 1946. Its title is "Judgment in Medicine." It contains much timely advice from one who has attained a high position in his profession.

The volume concludes with the annual medical report of the hospital and a cumulative index of previous volumes.

O. G.